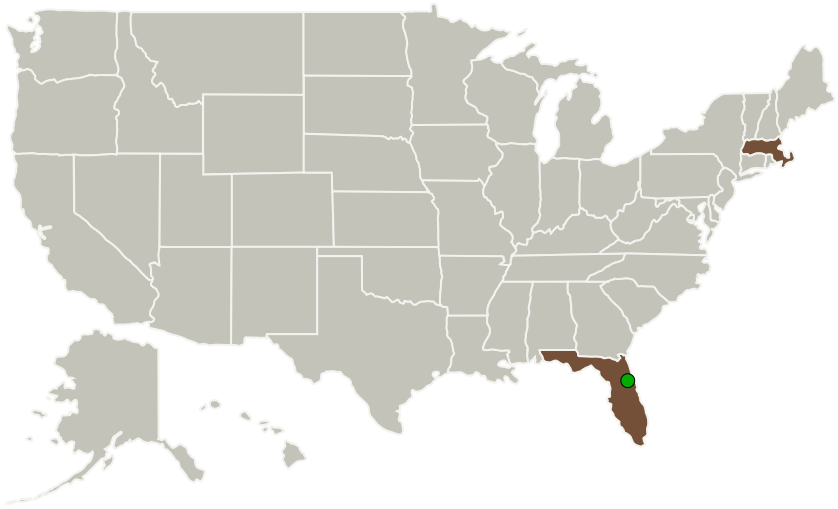
Real-Time Ethylene Sensor Based on Chemical Anisotropic Nanochannel Impedance Spectroscopy, Phase I

Completed Technology Project (2016 - 2016)

Project Introduction

NASA has need of a real-time sensor capable of <25ppb detection of ethylene for off-world greenhouse monitoring. NanoLab proposes the use of a fundamentally new style of sensor based off of anisotropic impedance analysis of vertically aligned nanotube arrays (VANTA). Specifically, we propose the use of chemical anisotropic nanochannel impedance spectroscopy (CANIS). This style of sensor provides up to eight degrees of analytical freedom, resulting in extreme discrimination between chemical species without requiring modification of the sensor to provide selectivity. For the particular application of ethylene sensing, NanoLab proposes the use of a carbon nanotube based CANIS sensor, sensitized to improve the interaction of ethylene with the surface, using either a metal or metal organic coating, in order to lower the limit of detection. The sensor will be self-referencing to minimize drift, and will be capable of simultaneously monitoring other relevant species, such as water, ethanol, acetaldehyde, and ammonia without interference to the detection of ethylene. The sensor will be lightweight, and have a footprint of 1cm x 1cm.

Primary U.S. Work Locations and Key Partners



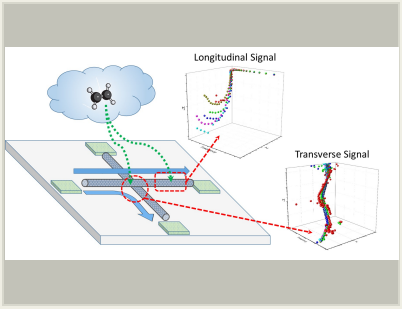


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Table of Contents

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
Nanolab, Inc	Lead Organization	Industry	Waltham, Massachusetts
Kennedy Space Center(KSC)	Supporting Organization	NASA Center	Kennedy Space Center, Florida

Primary U.S. Work Locations	
Florida	Massachusetts

Project Transitions

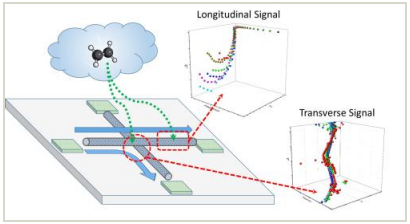
June 2016: Project Start

December 2016: Closed out

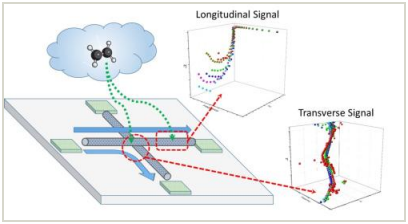
Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/140478)*

Images



Briefing Chart Image
Real-time Ethylene Sensor Based on Chemical Anisotropic Nanochannel Impedance Spectroscopy, Phase I
(https://techport.nasa.gov/image/125742)



Final Summary Chart Image
Real-time Ethylene Sensor Based on Chemical Anisotropic Nanochannel Impedance Spectroscopy, Phase I Project Image
(https://techport.nasa.gov/image/132978)

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Organization:
Nanolab, Inc

Responsible Program:
Small Business Innovation Research/Small Business Tech Transfer

Project Management

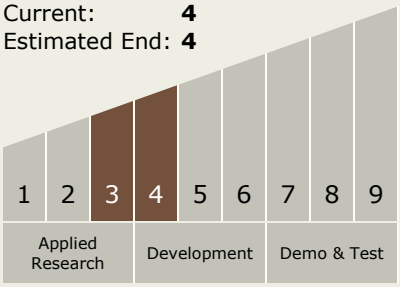
Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
Thomas T Morgan

Technology Maturity (TRL)

Start: **3**
Current: **4**
Estimated End: **4**



Real-Time Ethylene Sensor Based on Chemical Anisotropic Nanochannel Impedance Spectroscopy, Phase I

Completed Technology Project (2016 - 2016)

Technology Areas

Primary:

- TX06 Human Health, Life Support, and Habitation Systems
  - TX06.4 Environmental Monitoring, Safety, and Emergency Response
    - TX06.4.1 Sensors: Air, Water, Microbial, and Acoustic

Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System